Gender Differences in Nutritional Status and Feeding Patterns among Infants in the Gaza Strip

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ABSTRACT

Objectives. This study examined gender variation in nutritional treatment and anthropometric status of infants in the Gaza Strip. Numerous studies have documented gender differences in health status in developing areas, generally finding boys to be at an advantage over girls. Social and economic characteristics in Gaza suggest that one might expect preferential treatment of boys there.

Methods. The study used data on two samples of infants 0 to 18 months of age collected from five health centers in Gaza. A variety of different analytic methods were used to look for gender differences in feeding patterns, prevalence of malnutrition, and anthropometric status.

Results. Although some differences in nutritional treatment and anthropometric outcome for infants of different socioeconomic status and between the earlier and later samples were found, no consistent gender differences were revealed.

Conclusions. The findings are consistent with several different explanations. First, expectations of finding gender differences may have been unfounded. Alternatively, such differences may have existed previously but have been eliminated through successful public health intervention, rising levels of education, and economic development. (*Am J Public Health.* 1995;85:965–969)

Introduction

In recent decades, numerous studies have documented gender differences in the health status of infants and children. Covering a range of health outcomes, including mortality rates, calorie and nutrient intake, and anthropometric indicators, the studies have almost invariably shown boys to be at an advantage over girls. Because these outcome measures are significantly determined by allocations of parental resources, observed differences suggest that the intrafamily allocation of food (and possibly other resource inputs such as medical care and parental attention) favors boys over girls.

The medical and social science literature contains a number of attempts to explain these differences, which could arise from three sources.[1] First, parents may prefer children of one gender. Second, parents may have no preference per se, but the returns to investment in one gender may be higher than in the other (e.g., if adult sons or daughters are more likely to assist their parents financially or in kind). Finally, parents may have no preference, but the cost of producing a given health outcome (e.g., "well nourished") is higher for one gender than for the other (although this seems implausible, particularly for infants).

Social and economic conditions in Gaza suggest that boys would indeed receive preferential treatment. This paper uses a unique data set collected in primary health clinics in Gaza between 1987 and 1989 to monitor the nutritional status of infants; while not technically a random sample, there is strong evidence that it is representative of Gaza infants. The data set contains detailed information on anthropometric status and nutritional input, allowing us to test for preferential treatment of boys vs girls.

Background

Gaza is a developing area located between Israel and Egypt. It was administered by Israel between 1967 and 1994. At the end of 1989, the area had a population of 612 000, and the annual rate of natural increase was 4.6%. In 1988, 50% of the population was under 15 years of age, and 21% was under 5 years of age.[2] The population is Palestinian Arab and is mainly concentrated in five urban centers and seven refugee camps located near the urban areas.

The literature on gender differences in infant health suggests that one might expect preferential treatment of boys in Gaza; in fact, there is a strong presumption among health workers themselves that boys are better nourished than girls. Although gender differences in Gaza have not been previously studied, other researchers have documented such differences elsewhere in the Near East and Middle East.[1,3–12] The Gaza population is almost entirely Moslem and has a patriarchal social structure, characteristics that some previous researchers have associated with gender preferences and differences in health outcomes.[12] Educational attainment of girls is consistently lower

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TABLE 1—Sample Sizes, by Sex and Age, Gaza, 1987 and 1989

Age, mo	Boys	Girls	Boys, %
1987 sample			
0–6	682	582	54.0
6–12	265	242	52.3
12–18	185	188	49.6
Total	1132	1012	52.8
1989 sample			
0–6	510	447	53.3
6–12	260	276	48.5
12–18	217	197	52.4
Total	987	920	51.8

Note. One randomly selected visit per child during the study period was used.

than that of boys, although the gap has narrowed and overall levels have risen in the last 2 decades.[2] Between 1986 and 1989, an average of 68.6% of males more than 14 years of age were either working or looking for work, in comparison with 2.6% of females. Wages for those women who do work are lower than the male average[2]; previous research has related lower educational and labor market opportunities for women to gender differences in child health.[12]

Methods

The present study used data collected as part of a broader study of infant growth and nutrition conducted by the Government Health Service between 1987 and 1992.[13] The data set covers infants attending five Government Health Service community health centers for routine immunizations during two periods: October 1, 1987, to March 21, 1988, and October 1, 1989, to December 31, 1989. Immunizations are scheduled at 1, 3, 4, 5, 6, 9, 12, and 15 months of age, as well as at school age. Immunizations, as well as all prenatal care and health care for children up to 3 years of age, are provided by the government without charge. Serosurveys (antibody tests) and administrative data indicate that more than 90% of Gaza infants are vaccinated.[2,14–16]

The data used here were collected as part of an evaluation of a nutrition intervention program initiated in 1988 and including growth monitoring, nutrition education for mothers, and routine, free supplementation of iron and vitamins A and D for infants. This program has been described in greater detail elsewhere.[13,17] Each child who visited for vaccination was measured (on a standard measuring table) and weighed. In addition, parents were asked whether the child was receiving breast milk, formula, cereal, fruit, vegetables, meat, and iron and vitamin A and D supplements at the time of the visit. This growth and nutrition information was recorded on the child's personal chart, which also included the date of the visit and the child's date of birth and parity. Data were collected retrospectively from these individual charts for all children receiving routine vaccinations during the sample periods. Visits for reasons other than vaccination were excluded. For infants who visited more than once during the study interval, one visit was randomly selected (by means of a computer algorithm) to avoid potential bias from overrepresentation by multiple attenders. The time between the study periods, as well as the focus here on children 0 to 18 months of age, ensured that no children appeared in both data sets. Age was calculated from the child's date of birth and date of visit.

The five health centers were classified by social class according to the general socioeconomic status (SES) of the area they served. Two areas (Sheikh Radwan, Rimal) were classified as being of higher social class, on the basis of education, income, and sanitation; they include many business and professional families, as well as refugees who have moved out of the refugee camps. The other three (Jebaliya, Shejaiya, Bandar) were classified as areas of lower SES. The 1989 sample did not include Sheikh Radwan.

Results

As a means of gauging the prevalence of malnutrition, length for age, weight for age, and weight for length were calculated for each child and standardized with the US National Center for Health Statistics/World Health Organization reference standard as the comparison.[18] The US Centers for Disease Control's Anthropometric Software Package[19] was used in making these calculations. Malnutrition was defined as at or below 90% of the US age- and gender-specific median for each of the three measures (e.g., the National Center for Health Statistics median weights were 7.8 kg for boys and 7.2 kg for girls at 6 months, while the median lengths at 6 months were 67.8 cm for boys and 65.9 cm for girls[18]). Low length for age is considered an indicator of chronic undernutrition over an extended period ("stunting"), low weight for length is considered an indicator of current acute undernutrition ("wasting"), and weight for age is a measure in which these two elements are confounded.[10,20,21]

Table 1 presents sample sizes by age and sex. Unless otherwise noted, the sample used here included one randomly selected visit per child (the mean number of visits per child was 1.3). The 1987 sample contained observations for 1132 boys and 1012 girls. Of these observations, 310 involved missing or erroneous data on length and/or weight, mostly among children 0 to 6 months of age. (Length and weight readings were excluded when the observations were far enough from the US median to be considered biologically improbable according to guidelines suggested by Jordan.[19] Specifically, this was if z-score values fell in the following ranges: length for age less than -6.00 or greater than 6.00, weight for age less than -6.00 or greater than 6.00, weight for length less than -4.00 or greater than 6.00, length for age greater than 3.09 and weight for length less than -3.09, and length for age less than -3.09 and weight for length greater than 3.09.) These observations were excluded for purposes of analyzing anthropometric status, leaving observations for 988 boys and 846 girls. The 1989 data set contained observations for 987 boys and 920 girls; the data set used for anthropometric analysis included 949 boys and 875 girls. In 1987, approximately one third of the total sample was in the higher SES group; in 1989, approximately one quarter was in that group. The sex distributions of the samples did not vary significantly by SES.

Table 1 shows that, while the sex distribution was fairly symmetrical overall, there were slightly more boys in most age categories. Analysis of the distribution of visits by age and sex indicates that boys and girls had very similar patterns of clinic visits. It thus seems likely that the higher proportion of boys in the sample reflected the true distribution in Gaza: among children 0 to 4 years of age, the ratio of boys to girls in 1988 was 1.05 (51.2% male).[2] In addition, the pattern of visits corresponded quite closely to the vaccination schedule, indicating that the decline in sample size with age was probably due to the schedule itself; indeed, the most multiple visits occurred for children 3 to 6 months of age, as the vaccination schedule would suggest.

Table 2 presents the prevalence of malnutrition by gender and age. The data show some differences by gender in prevalence of malnutrition, but most of these differences were not statistically significant. Girls in the 12- to 18-month group were significantly disadvantaged in weight for age ($P < .01$) and length for age ($P < .10$) in the 1987 sample, but there were no significant gender differences in the 1989 sample. One notable finding is that the overall prevalence of malnutrition (weight for age and length for age) rose with age in both samples; the prevalence of low weight for length fell with age, but this may have been an artifact of changes in the other two indicators. We also examined the prevalence of severe malnutrition (defined as below 80% of the US median), but there were no observable gender differences, and the overall prevalence was low for all sex, age, and SES groups (mean length and weight for the study sample are available from the authors).

Restricting analysis to whether anthropometric status lies above or below 90% of the US median may mask more subtle differences in nutritional status. An alternative way of comparing the development of boys and girls is to compare *z* scores for anthropometric outcome. The *z* score of length for age, for instance, is computed by subtracting the age- and gender-specific median length for the comparison population from the child's length and dividing by the age- and gender-specific standard deviation for the comparison population. This provides the number of standard deviations by which the child is above or below the age- and gender-specific US median.

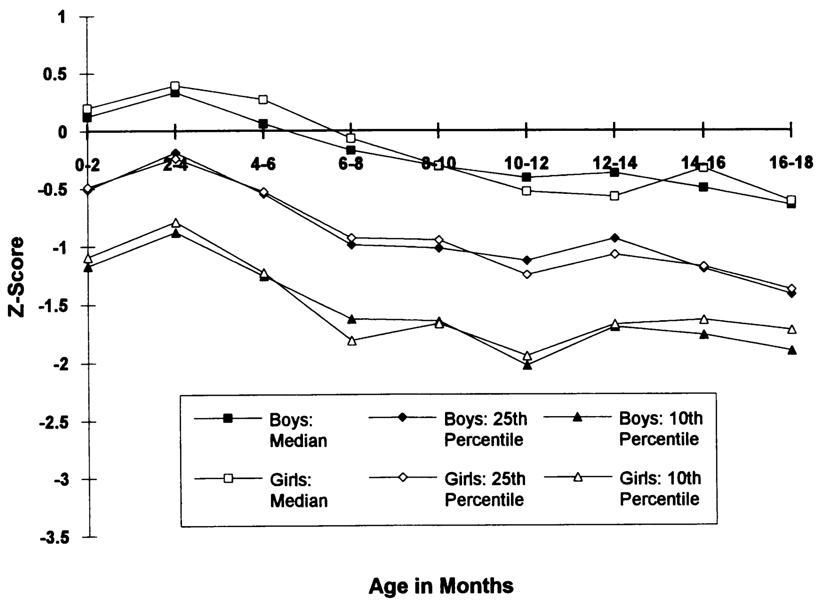
Figure 1 compares the distribution of *z* scores for boys and girls by age for weight for age. Distributions for length for age and weight for length were very similar to the distribution illustrated in Figure 1 and are not presented here. Percentiles refer to the distribution in the Gaza data, with the 1987 and 1989 cohorts combined. Thus, among both boys and girls 0 to 2 months of age, the median weight for age *z* score was approximately 0.2, while the lowest 25% were at or below −0.5 and the lowest 10% were at or below approximately −1.2. Figure 1 confirms that nutritional status declined with age. However, there were no consistent gender differences, even among boys and girls in the lowest 10% of their respective distributions.

These results address the question of differences in health status between boys and girls but do not directly address the question of differential treatment. Table 3 presents data on duration of breast-feeding and the weaning process. Breast-feeding is considered an important contributor to infant health and development. Several authors have proposed that breast-feeding patterns are a function of the mother's attachment to and interest in a child,[10,22] and a number of studies have examined gender biases in weaning patterns in other areas. In 1987, the duration of breast-feeding (measured here as the proportion in each age group being breast-fed) did not vary by gender. In 1989, girls appeared slightly more likely to be breast-fed between 6 and 12 months of age, although a higher proportion of boys

TABLE 2—Prevalence of Malnutrition among Gaza Infants: Proportion of Children Below 90% of the US Median, by Sex and Age

	1987 Sample			1989 Sample		
Age, mo	Boys, %	Girls, %	*P*	Boys, %	Girls, %	*P*
Weight for age						
0–6	21.0	18.6	.313	15.4	14.9	.837
6–12	31.4	30.3	.803	28.7	29.7	.802
12–18	23.2	39.2	.003	30.1	32.5	.617
Length for age						
0–6	2.2	1.6	.506	2.5	1.5	.274
6–12	7.1	5.3	.427	6.7	5.6	.594
12–18	8.4	14.9	.078	9.6	8.4	.677
Weight for height						
0–6	22.7	20.6	.402	18.5	20.5	.458
6–12	15.1	19.2	.242	19.7	24.9	.152
12–18	15.5	16.2	.861	16.8	15.2	.670

Note. P values are for chi-square tests (null hypothesis: no difference between boys and girls).



Note. The *z*-score standardization was based on the US National Center for Health Statistics reference population.

FIGURE 1—Distribution of weight for age *z* scores, by age: 1987 and 1989 combined.

TABLE 3—Feeding Patterns among Gaza Infants, by Sex and Age

	1987 Sample			1989 Sample		
Age, mo	Boys, %	Girls, %	*P*	Boys, %	Girls, %	*P*
			Breast-feeding[a]			
0–6	91.5	89.7	.300	88.1	90.2	.300
6–12	69.5	70.1	.877	78.4	83.9	.109
12–18	51.4	45.0	.225	77.3	66.8	.019
			Meat			
0–6	2.0	1.4	.411	1.4	2.7	.144
6–12	24.9	26.7	.656	20.8	23.4	.462
12–18	63.0	57.8	.312	48.3	46.9	.777
			Vitamins			
0–6	19.8	17.0	.206	47.1	45.6	.660
6–12	26.7	24.8	.625	77.3	76.8	.891
12–18	24.2	30.9	.150	65.9	67.5	.728
			Iron			
0–6	15.1	13.3	.347	39.6	36.5	.318
6–12	37.6	39.3	.700	83.9	85.1	.678
12–18	46.2	47.3	.831	73.3	75.6	.582

Note. P values are for chi-square tests (null hypothesis: no difference between boys and girls).
[a]Includes children only being breast-fed and those being breast-fed and receiving other food.

continued to be breast-fed after 12 months of age.

Although surveys in other countries have documented gender differences in the allocation of protein, and although meat was the most expensive of the food items measured in this data set, the proportion of children in this sample receiving meat also did not vary by gender (Table 3). Gender differences were observed in the proportion of children receiving vitamins and iron (provided free of charge by the Government Health Service), but the differences were not significant and showed no consistent bias (Table 3).

The analyses in Table 3 were repeated separately for children in the lower and higher socioeconomic groups to examine the possibility that gender differences in infant nutrition vary systematically by SES. In general, the data show a higher prevalence of malnutrition among those classified as belonging to the lower socioeconomic group; poorer children were up to several times as likely to be undernourished (particularly with regard to length for age, an indicator of chronic malnutrition). However, the gender distribution of nutritional status for both SES groups mirrored that of the unstratified sample.

Similarly, although feeding patterns varied by SES, there were no systematic gender differences in feeding patterns in either socioeconomic group. In 1987, children in the higher SES group were breast-fed longer than children in the lower SES group; in 1989, breast-feeding patterns were similar for both socioeconomic groups. Among children 6 to 12 months of age in 1989, girls in the higher SES group were significantly more likely than boys to receive meat, while these results were reversed for infants in the lower SES group. Children in the higher socioeconomic group were more likely to receive iron and vitamin supplements in both sample periods, particularly after 6 months of age, but again there were no observed gender differences.

The preceding results show little evidence that girls are disadvantaged relative to boys in either nutritional treatment or prevalence of malnutrition. While this is a positive finding, particularly that girls are not generally more likely to be malnourished, such bivariate analyses may nevertheless obscure possible gender differences in nutritional status. To examine this possibility, we estimated ordinary least squares regression models with anthropometric status (*z* scores of weight for age and length for age) as the dependent variable and demographic characteristics and nutritional treatment as the explanatory variables. The results consistently confirmed the previous findings: nutritional status fell significantly with age, but this effect did not differ for boys and girls. In addition, there were no significant gender differences in the relationship between nutritional status and the available measures of nutritional treatment, SES, or parity. Detailed results are available from the authors.[23]

Discussion

On the whole, the data show few significant gender differences either in allocations of resources or in nutritional outcome. The clearest findings are those shown in Table 2 for older children in 1987: girls 12 to 18 months of age were nearly twice as likely to have both low weight for age and low length for age. Such an outcome would be consistent with the cumulative effects of neglect if girls and boys were born approximately equal (as Figure 1 suggests). Younger infants receive a much larger percentage of total nutrients from breast milk, and the results in Table 3 suggest that breast-feeding patterns are similar for boys and girls. However, as children grow older, differences in allocation of other nutritional resources would have an increasing effect on health status. This is, in fact, similar to the pattern found by Ahmed et al. in their study of Cairo infants.[9] At the same time, no statistically significant gender differences were observed in the 1989 cohort for any age group or outcome measure. The nearly universal immunization coverage in Gaza, combined with the facts that boys and girls in our sample exhibited nearly identical visit patterns and that the sex ratio was in line with population data, suggests that these findings are not merely artifactual.

It seems plausible that both socioeconomic issues and discriminatory preferences motivate treatment of infants,[24] and both factors might be expected to favor boys in Gaza. Given that the data do not show boys being preferred in either treatment or outcome, it is possible that such expectations are unfounded. Most generally, Obermeyer has argued persuasively that describing a society as Muslim and patriarchal is not sufficient to adequately summarize its demographic characteristics.[25] Certainly, the social and political situation in Gaza is complex and dynamic and was particularly so during the period covered here.

There are other possible answers, such as that health differences existed previously but have been eliminated by particular public health interventions. The evidence here, which indicates that girls at older ages were somewhat more likely to be malnourished than boys in 1987 but not in 1989, suggests that public health interventions may have played a positive role in reducing gender discrimination. Available records indicate that infant mortality declined from 76 per 1000 live births in 1978 to 40 per 1000 in 1990,[26] in large part as a result of primary health care interventions that have led to a marked decline in diphtheria, pertussis, tetanus, polio, and measles.[14,15,27] In these data, the decline in overall levels of malnutrition, lengthening of the duration of breast-feeding, and increased use of vitamins and iron observed between 1987 and 1989 were strongly associated with public health initiatives.[13] Alternatively, rising levels of education—both among women and overall—may have positively affected parental behavior and infant nutrition, narrowing or eliminating previous gender differences in infant health. Unfortunately, our data were unable to distinguish between such explanations.

Data on the actual quantities of food provided to children would enable more sensitive examination of parental allocation decisions. The current data, which recorded only whether or not children were receiving the specific foods near the time of the visit, may mask differences in the amounts allocated even when similar proportions of boys and girls receive a given food. In addition, the data permitted only limited analysis of parental income and contained no information on educational levels, age of parents, and other factors that may affect both nutritional treatment and outcome. These characteristics are presumably uncorrelated with infant gender, but their effect on food allocations may not be the same for boys and girls.

Further research is warranted, especially studies of older age groups and studies using more detailed data on parental behavior and characteristics. However, the similarity of boys and girls in both the treatment and outcome measures reported here must be seen as a strong positive finding, given the prior expectation that girls would be at a relative disadvantage. Furthermore, the improvements in nutritional status observed across the two data sets suggest that intervention programs designed to improved infant nutrition may also narrow gender differences in outcome; certainly, there is less room for differentials in health when overall levels of health status are high. □

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